

CLAIMS

SUB
A2 1. A mobile station, for use in a CDMA communications network, including:

5 wanted signal processing means for processing an input signal, representing a CDMA transmission signal received at the mobile station from a base station of the network, to derive therefrom a wanted signal embodying a preselected spreading code;

10 code information receiving means for receiving from the base station code information identifying a further spreading code assigned by the network to an interfering signal of another network user; and

15 interfering signal processing means for employing the further spreading code identified by the received code information to reduce the interference effect of that interfering signal on the derived wanted signal.

2. A mobile station as claimed in claim 1, wherein:

20 the said code information receiving means are operable to receive from the base station a plurality of items of code information corresponding respectively to a plurality of such interfering signals, each such item identifying a spreading code assigned by the network to its corresponding interfering signal; and

25 the said interfering signal processing means are operable to employ the spreading codes identified by the received items to reduce the interference effect on the derived wanted signal of each of the interfering signals of the said plurality.

30 3. A mobile station as claimed in claim 1 or 2, wherein the said input signal of the wanted signal processing means is pre-processed by the interfering signal processing means to reduce or cancel components in the input signal associated with the or each said interfering signal.

35 4. A mobile station as claimed in claim 3, wherein the said interfering signal processing means are

operable to derive, for the or each said interfering signal, a corresponding interference cancellation signal representative of a component in the said input signal associated with that interfering signal.

5 5. A mobile station as claimed in claim 4, wherein the said interfering signal processing means are operable to subtract the or each said interference cancellation signal from a signal representing the received CDMA transmission signal to produce the said
10 input signal of the wanted signal processing means.

6. A mobile station as claimed in claim 4 or 5, wherein the said interfering signal processing means are operable to derive the or each said corresponding interference cancellation signal from a signal
15 representing the said received CDMA transmission signal.

7. A mobile station as claimed in any one of claims 4 to 6, wherein the said interfering signal processing means has, for the or each said interfering signal, a
20 corresponding processing unit for deriving the said interference cancellation signal corresponding to that interfering signal, which processing unit includes:

code generator means for generating the identified spreading code assigned to the said interfering signal;

25 despreading means connected for receiving a first signal representing the received CDMA transmission signal and also connected to the said code generator for receiving the generated spreading code, and operable to despread that signal to produce a second
30 signal representing the said interfering signal; and

respreading means connected to the said despreading means for receiving therefrom said second signal and also connected to the said code generator means for receiving the generated spreading code, and
35 operable to respread the said second signal to produce the said corresponding interference cancellation

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signal.

8. A mobile station as claimed in any one of claims 4 to 7, wherein the said interfering signal processing means further include:

5 signal delay means connected for receiving a basic signal representing the said received CDMA transmission signal and operable to delay that basic signal by a preselected delay time to produce a delayed version thereof, the said input signal of the or each said
10 processing unit being provided directly by, or being derived from, the said basic signal; and

 subtraction means connected for receiving the said delayed version of the said basic signal and the or
15 each said interference cancellation signal, and operable to produce the said input signal of the said wanted signal processing means in dependence upon the difference between the said delayed version and the or
20 each interference cancellation signal.

9. A mobile station as claimed in any preceding
20 claim, wherein one or both of the said wanted signal processing means and the said interfering signal processing means comprise(s) a RAKE receiver having a plurality of fingers for processing different
25 respective paths of the received CDMA transmission signal.

10. A mobile station as claimed in claim 9, wherein
30 each of the said wanted signal processing means and the said interfering signal processing means comprises such a RAKE receiver, and the said mobile station further comprises:

 path searcher means connected to the said wanted signal processing means and to the said interfering signal processing means for supplying the same path information thereto; and

35 path information delay means connected between the said path searcher means and the said wanted signal

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processing means for delaying supply of the path information to the wanted signal processing means for a preselected delay time after the same path information is supplied to the said interfering signal processing means.

11. A mobile station as claimed in any preceding claim, wherein the said code information receiving means are operable to receive the said code information via a common control channel broadcast by the base station to all mobile stations in its area.

12. A mobile station as claimed in any one of claims 1 to 10, wherein the said code information receiving means are operable to receive the said code information via a control channel associated individually with the mobile station.

13. A mobile station as claimed in any preceding claim, wherein the said base station is operable to form respective beams for directing its CDMA transmission signals towards their respective users and is also operable to transmit to the said mobile station interference judgement information providing, for each of a plurality of users operating in its area, information relevant to assessing an interference effect on the wanted signal of the said mobile station of an interfering signal of the user concerned;

the said mobile station comprising:

interfering signal assessment means for assessing the said interference effect of the interfering signal of each user of the said plurality based on the received interference judgement information; and

interfering signal selection means for selecting one or more of the interfering signals from amongst the respective interfering signals of the users of the said plurality based on the results of the assessment.

14. A mobile station as claimed in claim 13, wherein the said interference judgement information for such a

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user of the said plurality includes position information of that user.

15. A mobile station as claimed in claim 13 or 14, wherein the said interference judgement information for such a user of the said plurality includes angular position information of the user relative to the base station.

16. A mobile station as claimed in any one of claims 13 to 15, wherein the said interference judgement information for such a user of the said plurality includes downlink transmission power level information of that user.

17. A mobile station as claimed in any one of claims 13 to 16, wherein the said interfering signal assessment means take account of the position of each user of the said plurality relative to the position of the mobile station in assessing the said interference effect.

18. A mobile station as claimed in any one of claims 13 to 17, wherein the said interfering signal assessment means include storage means for storing the received interference judgement information for each user of the said plurality.

19. A mobile station as claimed in any one of claims 13 to 18, wherein the users of the said plurality are users whose downlink transmission rates exceed a predetermined threshold value.

20. A base station, for use in a CDMA communications network, including:

interfering signal designating means for designating at least one of a plurality of downlink signals transmitted by the base station as being an interfering signal having an interference effect on a wanted signal of a subject mobile station of the network; and

code information transmission means for including,

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in a predetermined control signal transmitted by the base station to the said subject mobile station, code information, identifying a spreading code assigned by the network to the designated interfering signal, for use by the subject mobile station to reduce the said interference effect of the said interfering signal on its said wanted signal.

21. A base station as claimed in claim 20, wherein the said predetermined control signal is broadcast by the base station to all mobile stations in its area using a common control channel.

22. A base station as claimed in claim 20, wherein the said predetermined control signal is transmitted by the base station to the said subject mobile station using a control channel associated individually with that mobile station.

23. A base station as claimed in any one of claims 20 to 22, further comprising:

interfering signal assessment means for assessing, for each of a plurality of users operating in the area of the base station, the said interference effect on the said wanted signal of the said subject mobile station of the downlink signal of the user concerned;

the said interfering signal designation means being operable to determine which downlink signals of the users of the said plurality are to be designated as such interfering signals based on the results of the assessment.

24. A base station as claimed in claim 23, wherein the said interfering signal assessment means are operable to assess the said interference effect in dependence upon the bit rate of the downlink signal.

25. A base station as claimed in any one of claims 20 to 24, wherein the said base station further includes beamforming means for forming respective beams for directing its CDMA transmission signals towards their

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respective users.

26. A base station as claimed in claim 25, wherein the said interfering signal assessment means are operable to assess the said interfering effect in dependence upon a position of the user relative to the said subject mobile station.

27. A base station as claimed in claim 25 or 26, wherein the said interfering signal assessment means are operable to assess the said interference effect in dependence upon one or more of the following criteria:

an angular position of the user relative to the said base station;

an angular position of the said subject mobile station relative to the base station;

a distance of the user from the base station;

a distance of the subject mobile station from the base station;

a downlink transmission power level of the user;

and

a downlink-signal bit-rate of the user.

28. A base station as claimed in claim 20, 21 or 22, further including:

beamforming means for forming respective beams for directing its CDMA transmission signals towards their respective users;

interference judgement information transmission means for including, in a predetermined control signal transmitted by the base station to the said subject mobile station, interference judgement information providing, for each of a plurality of users operating in the area of the base station, information relevant to assessing an interference effect on the said wanted signal of the downlink signal of the user concerned.

29. A base station as claimed in claim 28, wherein the said interference judgement information for such a user of the said plurality includes position information of

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that user.

30. A base station as claimed in claim 28 or 29,
wherein the said interference judgement information for
such a user of the said plurality includes angular
position information of the user relative to the base
station.

31. A base station as claimed in any one of claims 28
to 30, wherein the said interference judgement
information for such a user of the said plurality
includes downlink transmission power level information
of that user.

32. A CDMA communications network including:

a mobile station; and

a base station operable to designate at least one
of a plurality of downlink signals transmitted thereby
as being an interfering signal having an interference
effect on a wanted signal of the said mobile station,
and also operable to include, in a predetermined
control signal transmitted thereby to the said mobile
station, code information identifying a spreading code
assigned by the network to the designated interfering
signal;

the mobile station being operable to receive the
said predetermined control signal and to employ the
said spreading code identified by the code information
included in that signal to reduce the said interference
effect of that interfering signal on the said wanted
signal.

33. A receiving method, for use in a mobile station of
a CDMA communications network, including the steps of:

receiving a CDMA transmission signal from a base
station of the network;

processing an input signal representing the
received CDMA transmission signal to derive therefrom a
wanted signal embodying a preselected spreading code;

receiving from the base station code information

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identifying a further spreading code assigned by the network to an interfering signal of another network user; and

employing the further spreading code identified by the received code information to reduce the interference effect of that interfering signal on the derived wanted signal.

34. A transmission method, for use in a base station of a CDMA communications network, including the steps of:

designating at least one of a plurality of downlink signals transmitted by the base station as being an interfering signal having an interference effect on a wanted signal of a subject mobile station of the network; and

including, in a predetermined control signal transmitted by the base station to the subject mobile station, code information, identifying a spreading code assigned by the network to the designated interfering signal, for use by the mobile station to reduce the said interference effect of the said interfering signal on its said wanted signal.

35. A CDMA communications method, including the steps of:

designating at least one of a plurality of downlink signals transmitted by a base station of the network as being an interfering signal having an interference effect on a wanted signal of a subject mobile station of the network;

including, in a predetermined control signal transmitted by the base station to the subject mobile station, code information identifying a spreading code assigned by the network to the designated interfering signal;

receiving the predetermined control signal at the mobile station and employing the spreading code

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identified by the code information included in that
signal to reduce the interference effect on the wanted
signal of that interfering signal.

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